

PATENT SPECIFICATION

(11) 1 566 326

1 566 326

- (21) Application No. 4022/77 (22) Filed 1 Feb. 1977
- (31) Convention Application No. 654433
- (32) Filed 2 Feb. 1976 in
- (33) United States of America (US)
- (44) Complete Specification published 30 April 1980
- (51) INT CL³ C11D 10/02 (C11D 10/02 1/72 3/22)
- (52) Index at acceptance

C5D 6A5C 6A5D2 6A5E 6B10B 6B11C 6B12B1 6B12F1
6B12N1 6B2 6B4 6B5 6B7 6C6 6C8

(72) Inventor CHARLES HENRY NICOL



(54) NONIONIC SURFACTANT-CONTAINING DETERGENT COMPOSITION WITH CELLULOSE ETHER

(71) We, THE PROCTER & GAMBLE COMPANY, a corporation organised under the laws of the State of Ohio, United States of America of 301 East Sixth Street, Cincinnati, Ohio 45202, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to detergent compositions containing cellulose ether soil release agents. More particularly, the detergent compositions herein contain (1) a nonionic surfactant having a specified critical micelle concentration at 25°C and a specified ratio of ethylene oxide groups to number of carbons in the hydrophobic portion of the surfactant and (2) a cellulose ether soil release agent.

There has been considerable effort expended in testing various compounds for use in detergent compositions for the purpose of imparting soil release properties to fabrics. The work has primarily been directed toward using various polymers as detergent composition additives with the intent of depositing such polymers onto cotton, polyester and polyester/cotton fabrics from the wash solution. The deposition of the polymers upon the fabrics insures that when the fabrics are subsequently soiled and washed, the soil is removed more easily therefrom.

Various cellulose ethers in particular have received a great deal of attention in the area of soil release technology. Examples of prior art wherein detergent compositions are disclosed containing various cellulose ethers are the following:

South African Patent Application, 72/7174, published October 9, 1972, Bevan; South African Patent Application, 73/5423, published August 9, 1973, Aldcroft, et al;

South African Patent Application, 71/5149, published August 7, 1971, Foster; South African Patent Application, 70/3911, published June 9, 1970, Davies, et al;

British Patent 1,314,897, published April 26, 1973;

British Patent 340,232, published December 17, 1930, Johnson;

British Patent 994,353, published June 2, 1965, Gibbons;

U.S. Patent 3,328,305, June 27, 1967, Lamberti;

U.S. Patent 3,703,470, November 21, 1972, Brennan; and

U.S. Patent 3,723,326, March 27, 1973, Cheng, et al.

The above prior art teaches that the disclosed detergent compositions may contain a wide range of anionic surfactants, nonionic surfactants, ampholytic surfactants, or zwitterionic surfactants. It has now been discovered that the selection of the surfactant for use in combination with the cellulose ethers has a substantial effect on the efficacy of the soil release properties imparted to the fabrics by the cellulose ether. The prior art fails to recognize that a detergent composition containing a nonionic surfactant and a cellulose ether soil release agent does not achieve optimum performance primarily because the commonly used nonionic surfactants will deposit upon fabrics prior to the cellulose ether. This has the effect of hindering the deposition of the soil release agent and/or of adversely affecting the bonding of the soil release agent to the fabrics.

It is an object of this invention to provide detergent compositions having satisfactory soil release properties,

and more specifically to provide a nonionic surfactant-containing detergent composition which is able to impart soil release properties to fabrics.

It is a more particular object of this invention to provide a detergent composition containing a nonionic surfactant as the major surfactant component together with a cellulose ether so as to provide a satisfactorily cleaning detergent composition.

As used herein, all percentages and ratios are by weight unless otherwise indicated.

According to the present invention, a detergent composition capable of imparting a soil release benefit to fabrics consists essentially of:

(a) from 5% to 65% of a water-soluble nonionic surfactant having the formula



wherein R is an alkyl, alkenyl or alkylaryl group of from 8 to 20 carbon atoms, n is from 4 to 30, and the ratio of n to the number of carbon atoms in R is at least 0.4, and having a critical micelle concentration (cmc) at 25°C of at least 50 ppm;

(b) from 0.1% to 5% of a cellulose ether selected from alkyl cellulose ethers having a DS alkyl of from 1.2 to 2.9, hydroxyalkyl cellulose ethers having a DS hydroxyalkyl of from 1.2 to 2.9, and hydroxyalkyl alkyl cellulose ethers having a DS alkyl of from 1.0 to 2.7, a DS hydroxyalkyl of from 0.01 to 1.0 and a total degree of substitution of at least 1.05, the alkyl and/or hydroxyalkyl substituents having from 1 to 4 carbon atoms; and

(c), as the balance of the composition, detergency adjunct materials.

The components of the detergent compositions of the present invention, i.e. the nonionic surfactant, the cellulose ether (soil release agent), and the balance (detergency adjunct materials), are each described hereinafter.

(a) Nonionic Surfactant

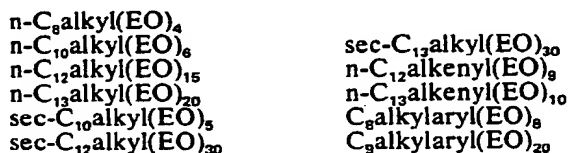
The nonionic surfactant included in the compositions of this invention has the following formula:



wherein R is an alkyl, alkenyl or alkylaryl group having from 8 carbon atoms to 20 carbon atoms, preferably 10 carbon atoms to 15 carbon atoms, and n is from 4 to 30, preferably 4 to 15, most preferably 6 to 12. Additionally the nonionic surfactant is characterized by having a critical micelle concentration at 25°C of at least 50 ppm, preferably at least 150 ppm, and a ratio of n to the number of carbon atoms in R of at least 0.4, preferably at least 0.6.

Nonionic surfactants are obtainable as condensation products of a long chain ethylene oxide moiety with a primary alcohol, secondary alcohol or alkyl phenol. Thus, R may be a straight or branched chain hydrocarbyl moiety derived from a primary or secondary alcohol containing 8 to 20 carbon atoms, preferably 10 to 15 carbon atoms, or again R may be an alkyl phenol-based moiety where the alkyl chain is straight or branched and contains from 6 to 12 carbon atoms, preferably 6 to 9 carbon atoms.

Illustrative nonionic surfactants having the desired characteristics (where EO is an abbreviation for the ethylene oxide moiety) are as follows:



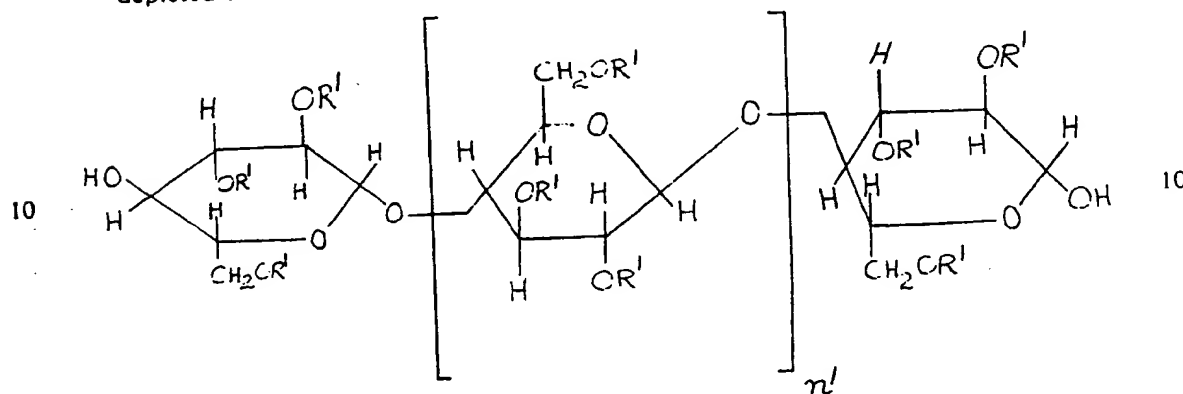
The above described nonionic surfactants are not normally considered to possess optimal detergency. However, it has been found that such surfactants do not interfere with the deposition and/or adherence of the cellulose ether soil release agent with respect to fabrics. The detergent compositions of this invention do satisfactorily clean despite containing a less than optimum detergency surfactant, due to the fact that the effective and efficient deposition of the soil release agent alleviates the need for a good detergency surfactant. That is, the deposition of the soil release agent on the fabrics ensures that when the fabrics are

soiled and subsequently washed, the soil is removed more easily. As such, a nonionic surfactant having less than what would be considered optimal detergency is able to remove the soil.

Detergent compositions of this invention, as specified earlier, contain from 5% to 65% of the above described nonionic surfactant.

(b) Cellulose Ether (Soil Release Agent)

The soil release agents contemplated herein comprise etherified celluloses. The basic structure of the cellulose ethers used in the present compositions is depicted as follows:



wherein n' is a finite number and wherein R' represents hydrogen, C_{1-4} alkyl, hydroxyalkyl having 1 to 4 carbon atoms, or mixed alkyl and hydroxyalkyl substituents each having 1 to 4 carbon atoms as described hereinafter. The molecular weight of the cellulose ether can range from 3,000 to 185,000. Useful alkyl groups include methyl, ethyl, propyl and butyl. The preferred alkyl group is methyl. Hydroxyalkyl groups include hydroxymethyl, hydroxyethyl, hydroxypropyl and hydroxybutyl, with hydroxybutyl being preferred. Of the commercially available materials having mixed alkyl and hydroxyalkyl substituents, preferred materials have R' as mixtures of methyl and hydroxybutyl.

Processes for preparing the cellulose ethers are known. Briefly, when preparing the alkyl cellulose ether soil release agents employed in the present compositions, the hydroxy groups of the anhydroglucose units of cellulose are reacted with an alkylating agent, thereby replacing the hydrogen of the hydroxyls with alkyl substituents. The number of substituent alkyl groups can be designated by weight percent, or by the average number of alkyl (i.e., as alkoxy) groups per anhydroglucose units, i.e., the Degree of Substitution (DS) alkyl. If all three available positions on each anhydroglucose unit are substituted, the DS alkyl is designated three (3); if an average of two $-OH$'s are substituted, the DS alkyl is designated two (2), etc. Similar nomenclature is used to define the hydroxyalkyl and hydroxyalkyl alkyl cellulose ethers employed herein. When describing the hydroxyalkyl alkyl celluloses, the degree of substitution of both substituent types is set forth.

Commercial processes for preparing alkyl cellulose ethers involve, for example, simply combining the desired alkyl halide, e.g., methyl chloride, with a cellulose feed stock under alkaline conditions. Suitable cellulose feedstocks include natural cellulose materials, e.g. wood pulp or cotton linters. Such a process results in a DS alkyl below 2, and most generally a DS alkyl of about 1.5.

Higher DS alkyl cellulose ethers are prepared by the exhaustive alkylation of cellulose using an alkyl halide, e.g., methyl chloride, and caustic, preferably sodium hydroxide, in a pressure vessel in a manner well known in the art for preparing the lower DS alkyl celluloses. However, the alkylation procedure is simply repeated and continued until the higher DS materials are secured. In either case, the progress of the alkylation reaction is monitored by periodically sampling the reaction product and determining the degree of alkoxylation by various means well known in the art. The exhaustive alkylation procedure herein result in the formation of cellulose ethers having a DS alkyl in the range of 1.7 to 2.9.

The alkyl cellulose ethers have a DS alkyl of from 1.2 to 2.9. Preferably the

alkyl substituent has from 1 to 4 carbon atoms. One class of highly preferred alkyl cellulose ethers herein has group R' as methyl and is characterized by a DS methyl in the range of 2.0 to 2.7.

The manufacture of the hydroxyalkyl alkyl cellulose soil release agents used herein is also carried out using well known procedures. In a typical method, a cellulose feedstock is swelled with caustic soda solution to produce alkali cellulose, which is then treated with an alkyl halide (preferably a C₁₋₄ alkyl halide, especially methyl chloride) and an alkylene oxide (preferably a C₁₋₄ alkylene oxide, especially butylene oxide). The DS alkyl and DS hydroxyalkyl of the resulting cellulose ether are varied, depending on the reaction stoichiometry and reaction times and temperatures used, all in well known fashion. The DS alkyl is from 1.0 to 2.7, preferably 1.3 to 2.5 and DS hydroxyalkyl of from 0.01 to 1.0, preferably 0.06 to 1.0 with a total DS of at least 1.05, preferably at least 1.5.

Similarly, hydroxyalkyl cellulose ethers are prepared by reacting cellulose feedstocks with an alkylene oxide and caustic, usually at elevated temperatures and pressures, in the manner known in the art. Its DS hydroxyalkyl is from 1.2 to 2.9, preferably 1.3 to 1.7. The hydroxyalkyl substituent preferably contains 1 to 4 carbon atoms.

The hereindescribed cellulose ethers have a molecular weight of from 3,000 to 185,000. Cellulose ethers having a low molecular weight, i.e., of from 3000 to 10,000, preferably 3500 to 8000, more preferably 4000 to 5500 and a DS methyl of from 1.8 to 2.7, preferably 2.1 to 2.4 are especially useful herein. Such cellulose ethers are described in U.S. Patent Specification No. 4,048,433. These cellulose ethers are prepared by initially methylating the cellulose feedstock in the manner above described and thereafter reducing its degree of polymerization by means of gaseous hydrogen chloride, aqueous acid hydrolysis or oxidative depolymerization. Such depolymerization reactions are described in the prior art. Alternatively the cellulosic feedstock may be cleaved initially, e.g. by using an oxidative depolymerization step, and then methylated in a conventional manner.

Representative, non-limiting examples of cellulose ether soil release agents used herein are as follows: methyl cellulose, DS methyl 2.1, M.W. 30,000; ethyl cellulose, DS ethyl 1.2, M.W. 100,000; methyl ethyl cellulose, DS methyl 1.0, DS ethyl 0.7, M.W. 50,000; hydroxyethyl cellulose, DS hydroxyethyl 1.2, M.W. 60,000; hydroxypropyl cellulose, DS hydroxypropyl 1.5, M.W. 40,000; methyl hydroxyethyl cellulose, DS methyl 1.5, DS hydroxyethyl 0.1, M.W. 120,000; methyl hydroxybutyl cellulose, DS methyl 1.5, DS hydroxybutyl 0.5, M.W. 30,000; butyl cellulose, DS butyl 1.5, M.W. 80,000; methyl cellulose, DS methyl 2.0, M.W. 4500; and methyl cellulose, DS methyl 2.5, M.W. 6000.

Cellulose ethers employed herein are water-soluble and are characterized by a negative temperature coefficient of solubility. Being polymeric, and having the potential for inter-molecular association by virtue of their sidechain substituents, the cellulose ethers herein increase the viscosity of aqueous solutions, especially when present therein in concentrations of about 2%. The solution viscosity of the cellulose ethers is not important when preparing granular detergent compositions, inasmuch as they are ultimately present in the aqueous laundry bath in such small concentrations. However, when preparing liquid detergent compositions in the manner of the present invention the solution concentration of the soil release ether is high enough that viscosity can be a problem. For example, it is desirable to provide liquid detergent compositions which are readily pourable and measurable, and which are not of a gelatinous or syrupy consistency. When preparing such liquid detergent compositions, it is preferred to select a cellulose ether of the foregoing type having a solution viscosity below about 250 centipoise (cps). Preferably, the solution viscosity of the cellulose ethers employed in the liquid detergent compositions prepared according to the present invention lies in the range from about 20 cps to about 200 cps (measured as a 2% wt. aqueous solution at 32°C).

The cellulose ether soil release agent comprises from 0.1% to 5%, preferably from 0.5% to 3% of the detergent composition. An amount below 0.1% is avoided due to the fact a noticeable effect is not obtained. Amounts greater than 5% can be used; however, additional soil release benefits are not obtained and therefore such amounts are avoided.

(c) Detergent Adjunct Materials

The balance of the detergent composition, which comprises detergency adjunct materials, can include one or more detergency builders, bleaches, e.g.

perborate bleaches, enzymes, perfumes, optical bleaches, processing aids, anticaking agents, or fabric softeners, for instance.

The detergent compositions herein can contain a minor amount of another surfactant. The minor addition of this surfactant does not detract from the overall benefits enjoyed by the above described detergent compositions. The additional surfactant can be a nonionic surfactant not meeting the above described limitations as to cmc at 25°C and *n* to carbon atom ratio as well as an ionic, ampholytic or zwitterionic surfactant. Such surfactants should not exceed 5% of the total surfactant concentration. Examples of this additional surfactant are found in U.S. Patent 3,664,961, May 23, 1972, Norris; see, for example, column 2, line 61 to column 9, line 3.

Detergent compositions herein are in any physical form, e.g. solid, granular, powder, liquid or paste form. Preferably the detergent composition is in a granular form. Such compositions can contain from 0.1% to 3%, preferably 0.5% to 2% of the cellulose ether soil release agent, from 5% to 35%, preferably 8% to 20% of the nonionic surfactant and from 10% to 80%, preferably 25% to 75% of a detergency builder.

Such built detergent compositions are intended for heavy duty laundering. Any of the known detergency builders are useful herein. Examples of suitable detergency builders are found in U.S. Patent 3,664,961, May 23, 1972, Norris; see, for example, column 9, lines 4—35. Suitable detergency builders also include the water-insoluble aluminosilicate described in German Patent Application 2,422,655, Corkill et al, published November 28, 1974.

The granular detergent compositions also optionally contain processing aids, e.g. sodium sulfate, and an anticorrosion agent, e.g. sodium silicate. A source of alkalinity is generally added when the composition is to be used for industrial cleaning purposes. Sodium or potassium hydroxide added at a level of up to 20% of the composition raises the pH of a wash solution to about 12 under normal usage conditions.

Liquid detergent compositions contain from 0.1% to 5%, preferably 0.5% to 3%, of the cellulose ether soil release agent, from 5% to 65%, preferably 20% to 50% of the nonionic surfactant, and the balance a liquid carrier. Examples of suitable liquid carriers are water and water-alcohol mixtures in which the ratio of water to alcohol is from 30:1 to 3:1. Lower alcohols, i.e. C₁ to C₄ alcohols, are preferred herein. The liquid formulations optionally contain an electrolyte, e.g. potassium chloride or potassium hydroxide at a level of from 0.1% to 10%, preferably 0.5% to 5%.

The following examples of this invention.

EXAMPLE I

The detergent compositions of this invention are tested for their ability to remove oily soil from fabrics in the manner discussed below.

A detergent composition of the following formula is used for testing purposes.

Sodium tripolyphosphate	53.0%
Nonionic surfactant	17.7%
Sodium sulfate	22.0%
Sodium silicate (SiO ₂ :Na ₂ O=2.0)	6.2%
Methocel HB-15,000	1.1%

(The word "Methocell" is a registered Trade Mark).

Methocel HB-15,000 is a hydroxybutyl methyl cellulose ether supplied by the Dow Chemical Company. It has a DS methyl of 2.1, DS hydroxybutyl of 0.08 and a molecular weight of 127,500 as determined by ultracentrifuge techniques.

Polyester (PE) and polyester/cotton (PE/C) fabric swatches are laundered in an aqueous bath containing 0.18% of the above detergent composition. The laundering is done in a Tergotometer for 10 minutes using 7 grain per gallon hardness water. Following the laundering/soil release ether treatment, the swatches are spotted with dirty motor oil and relaundered under the same conditions. Percent soil release is determined gravimetrically for each of the swatches. The following table indicates the results obtained from the above detergent compositions with different nonionic surfactants and different wash solution temperatures.

TABLE I

Composition	Surfactant	cmc at 25°C (ppm)	n/C Ratio	38°C PE (% Soil Release)	38°C PE/C (% Soil Release)	27°C PE (% Soil Release)	27°C PE/C (% Soil Release)	16°C PE (% Soil Release)	16°C PE/C (% Soil Release)
A	C ₁₁₋₁₈ secondary alcohol ethoxylated with 12 moles ethylene oxide	30	0.6	97.7	39.3	19.2	34.8	9.1	28.5
B	Nonylphenol ethoxylated with 9 moles of ethylene oxide	65	1.0	70.7	40.0	17.0	38.4	11.8	34.3
C	Nonylphenol ethoxylated with 15 moles of ethylene oxide	124	0.3	89.6	42.9	20.8	34.8	9.8	35.2
D	C ₁₀ straight chain alcohol ethoxylated with 3 moles of ethylene oxide	151	0.4	26.0	27.0				
E	C ₁₀ straight chain alcohol ethoxylated with 4 moles of ethylene oxide	228	0.6	98.0	33.0	23.0	35.0	20.0	38.0
F	C ₁₀ straight chain alcohol ethoxylated with 6 moles of ethylene oxide	350	0.9	97.0	40.0	70.0	39.0	40.0	36.0
G	C ₁₀ straight chain alcohol ethoxylated with 9 mole of ethylene oxide			97.0	95.0	95.0		92.0	47.0

The above results show satisfactory soil release performance (especially at higher temperatures) is obtained from the detergent compositions containing a nonionic surfactant having the proper cmc at 25°C and n/C ratio, i.e. Compositions A, C, E, F and G. Composition B shows significantly less soil release performance than the compositions of this invention when used on polyester fabrics at the higher temperatures, with about the same performance at the lowest temperature. Composition D gives unsatisfactory oily soil release performance when used on both polyester and polyester/cotton fabrics.

Substantially the same results are obtained when the following cellulose ethers are substituted for the Methocel HB-15,000: methyl cellulose, DS methyl=1.5, M.W.=30,000; hydroxypropyl cellulose, DS hydroxypropyl=1.3, M.W.=100,000; hydroxybutyl cellulose, DS hydroxybutyl=2.1, M.W.=100,000; methylhydroxypropyl cellulose, DS methyl=1.2, DS hydroxypropyl=0.5, M.W.=150,000; and methyl cellulose, DS methyl=2.1, M.W.=4,000.

EXAMPLE II

Detergent compositions containing various methyl cellulose ethers are tested in the manner indicated below. The cellulose ether and a nonionic surfactant as listed below are used to prewash polyester and polyester/cotton fabric swatches. The prewash comprises washing the fabrics in a Tergotometer for 10 minutes at 38°C with 7 grain hardness water; 12 ppm cellulose ether and 100 ppm surfactant A or 200 ppm surfactant B are used. Surfactant A is a C₁₀ straight chain alcohol ethoxylated with 4 moles of ethylene oxide (cmc at 25°C=151 ppm, n/C=0.4). Surfactant B is a C₁₀ straight chain alcohol ethoxylated with 9 moles of ethylene oxide (cmc at 25°C=350 ppm, n/C=0.9). After the fabrics have been soiled with dirty motor oil, they are washed with a detergent composition having the following formulation.

Sodium C ₁₂ linear alkyl benzene sulfonate	7.6%
Sodium tallow alkyl sulfate	9.4%
Sodium tripolyphosphate	50.0%
Sodium silicate (SiO ₂ :Na ₂ O=2.0)	6.0%
Sodium sulfate	15.0%
Miscellaneous (water, brightener and perfume)	Balance

The follow results are obtained.

TABLE 2

Polymer	DS Methyl	Molecular Weight	Surfactant A		Surfactant B	
			PE	PE/C	PE	PE/C
A	1.08	74,110	95.8	42.6	95.1	30.6
B	1.9	55,730	96.4	52.3	95.8	44.0
C	2.4	58,520	97.3	60.5	96.0	41.1
D	2.06	36,310	98.4	63.1	95.8	40.5
F	2.02	127,500	98.4	50.8	96.3	39.2

The above results indicate that a variety of cellulose ethers having different DS methyls and molecular weights are all effectively used in a detergent composition containing the indicated nonionic surfactants.

EXAMPLE III

A liquid detergent composition is as follows:

	Percent
C ₁₀ straight chain alcohol ethoxylated with 6 moles of ethylene oxide	20.0
Methyl cellulose ether (DS methyl=1.8, M.W.=6000)	2.0
Triethanolamine	3.0
Water	71.0
Ethanol	2.5
Perfume, dye, minors	Balance

The composition of Example III is used at a concentration of 0.1% in an aqueous bath to launder polyester fabrics. The fabrics are cleaned and provided with a soil release finish of the cellulose ether.

WHAT WE CLAIM IS:—

1. A detergent composition consisting essentially of (a) from 5% to 65% of a water-soluble nonionic surfactant having the formula



- 5 wherein R is an alkyl, alkenyl or alkylaryl group of from 8 to 20 carbon atoms, n is from 4 to 30, and the ratio of n to the number of carbon atoms in R is at least 0.4, and having a critical micelle concentration at 25°C of at least 50 ppm; 5
- (b) from 0.1% to 5% of a cellulose ether selected from alkyl cellulose ethers having a DS alkyl of from 1.2 to 2.9, hydroxyalkyl cellulose ethers having a DS 10 hydroxyalkyl of from 1.2 to 2.9, hydroxyalkyl alkyl cellulose ethers having a DS alkyl of from 1.0 to 2.7, a DS hydroxyalkyl of from 0.01 to 1.0 and a total degree of substitution of at least 1.05, the alkyl and/or hydroxyalkyl substituents having from 1 to 4 carbon atoms; and 10
- (c), as the balance of the composition, detergency adjunct materials. 15
2. The detergent composition of Claim 1 wherein the ratio of n to the number of carbon atoms in R is at least 0.6, and the critical micelle concentration at 25°C is at least 150 ppm. 15
3. The detergent composition of Claim 1 or 2 wherein R is a straight or branched chain hydrocarbyl moiety derived from a primary or secondary alcohol and has from 10 to 15 carbon atoms and n is from 4 to 15. 20
4. The detergent composition of Claim 1 or 2 wherein R is an alkyl phenol-based moiety where the alkyl chain has from 6 to 12 carbon atoms and n is from 4 to 15. 20
5. The detergent composition of Claim 1, 2, 3 or 4, wherein the cellulose ether is an alkyl cellulose ether. 25
6. The detergent composition of Claim 1, 2, 3 or 4, wherein the cellulose ether is a hydroxyalkyl cellulose ether. 25
7. The detergent composition of Claim 1, 2, 3 or 4, wherein the cellulose ether is a hydroxyalkyl alkyl cellulose ether. 25
8. The detergent composition of Claim 5 wherein the cellulose ether has a molecular weight of from 3000 to 10,000 and a DS alkyl of from 1.8 to 2.7. 30
9. The detergent composition of Claim 8 wherein the cellulose ether has a molecular weight of from 3500 to 8000. 30
10. The detergent composition of Claim 9 wherein the cellulose ether has a molecular weight of from 4000 to 5500 and a DS alkyl of from 2.1 to 2.4. 35
11. The detergent composition of any preceding Claim, being a composition which is in a granular form. 35
12. The detergent composition of Claim 11 wherein the cellulose ether is present at a level of from 0.1% to 3%. 35
13. The detergent composition of Claim 11 or 12 containing from 10% to 80% of a detergency builder. 40
14. The detergent composition of Claim 13 wherein the detergency builder is present at a level of from 25% to 75%. 40
15. The detergent composition of Claim 11, 12, 13 or 14 wherein the nonionic detergent is present at a level of from 5% to 35%. 45
16. The detergent composition of Claim 15 wherein the cellulose ether is present at a level of from 0.5% to 2% and the nonionic surfactant is present at a level from 8% to 20%. 45
17. The detergent composition of any of Claims 1 to 10, being a composition which is in a liquid form. 50
18. The detergent composition of Claim 17 consisting essentially of: 50
- (a) from 20% to 50% of the nonionic surfactant;
- (b) from 0.5% to 3% of the cellulose ether; and
- (c), as the balance, a liquid carrier. 50
19. The detergent composition of Claim 18 wherein the liquid carrier is water. 55
20. The detergent composition of Claim 18 wherein the liquid carrier is a water and lower alcohol mixture in which the ratio of water to alcohol is from 30:1 to 3:1. 55
21. The detergent composition of Claim 20 additionally containing from 0.1% to 10% of an electrolyte. 55

22. The detergent composition of Claim 21 wherein the electrolyte is potassium chloride.

23. The detergent composition of Claim 1 substantially as hereinbefore described in any of the examples.

For the Applicant,
CARPMAELS & RANSFORD,
Chartered Patent Agents,
43 Bloomsbury Square,
London, WC1A 2RA.

Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1980
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from
which copies may be obtained.

THIS PAGE BLANK (USPTO)